ChemRisk/Shonka Research Associates, Inc., Document Request Form

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Dato July 11, 1945 Subject: Smoke Tosts of Ventilatika in Process Area Buildings

> PLANT REPORCE UPPT. CONTROL SILES

Below are given the results of four series of smoke tests made on Larch 5, Harch 12, April 19, and Hay 16, 1945, to dotormine the air currents; set up by existing ventilating equipment in the Process Area and the offeet of shutting down certain fons and/or closing certain louvers. Il-15 Orango finalic Granades were used as the source of snoke.

Those tests were nade with the knowledge and approval of Captain .... Bookwith and the Carbide Operations and Socurity Departments. Tests word conducted by members of the Safety Department, usually in the presence and with the assistance of operating personnel.

A description of the tosts and thoir results follows:

## Larch 5.

Snoke set off in service alloy at end of building K-305-2, adjacent to disposal vacuum pump location. Ventilating fons all operating. Roof ventilators and louvers on all floors open.

> Snoke drifted up into pipe gallery where it hung for quite a poriod (10 minutes) and finally dissipated, and into real on west side of alley. Snoke also pulled into withdrawal alloy No. 10, whence part of it rose slowly to pipe gallery and balance was pulled into basement and blown back to stage floor and also through ducts to operating floor. The latter cloared in approximately 15-20 minutes.

Snoke released in basement adjacent to intake of operating floor 2. fan. Vontilation as abovo.

> Snoke emitted on operating floor in four (4) seconds. lie appropiable amount of smoke on other floors of building except a little in pipe gallery that drifted down through coolant pump wolls. (Quite a bit of snoke drifted to operating floor of adjacent building).

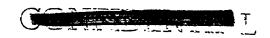
Samo as (2).

Rosults identical.

Snoke released in withdrawal alley No. 10, about midway of alley longtitudinally, and adjacont to platform of building K-305-2. (Thoro was a partition running longthwise through middle of withdrawal alloy). Transons in impodiate vicinity of source of snoke closed. Other ventilation as in provious tests.

Carbide and Carbon Chemicals Corporation, Operating Contractor for

the U.S. Atomic Energy Commission.



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Choke was pulled through loaks around closed transces immodiately, very little making its way through transcess
left open at a distance of approximately 50 foot in either
direction from source of smoke. However, the leakage through
closed transcess was insufficient to be picked up innediately
by operating floor feas. A little smoke reached the operating
floor, presumably through coelant pump wells, but possibly
from operating floor feas. About six (6) minutes were required for any smoke to appear on operating floor.

- 5. Inoto released in some location as in (4). Ventilating conditions were as follows (conditions prescribed for energency):
  - (a) Transons from withdrawal alloy to basement closed.
  - (b) All louvored grilles in operating floor closed.
  - (c) All louvors in duots over escape alley closed.
  - (d) All roof ventilators open.
  - (e) Operating floor fems off.

There was considerable leakage through transons to basement, but this was picked up by cell fans. Snoke was heavy in pipe gallery but gradually found its way out roof ventilators. Only a little make found its way to the operating floor, and this in north west cormer.

5. Snoke released in some location as in (4). Ventilation conditions normal as in (1), except operating floor fans off and all transons closed.

Rosults did not differ approciably from those previous test (5). (The source of stake on operating floor was found to be through door to stairway to cell floor, which was left open. A large fon in an effice adjacent to this door may have affected results).

#### Harch 12.

- 7. Snoko released in withdrawal alley 1A, at point adjacent to platform of K-510-5, about midway of longth of alley. Ventilating equipment as follows:
  - (a) Transons in vicinity of release closed.
  - (b) Doors between cells in 310-2 and 5 open.
  - (c) Operating floor fens off.
  - (d) Coll fans on with all discharge ducts open.
  - (c) Louvors in ducts over escape alloy part open and part closed (left as found).
  - (f) Louvored grilles on operating floor open.
  - (g) Roof vontilators open.
  - (h) Doors at head of stairways on operating floor closed.

Smoke pulled into basement to some extent, through poorly fitting transoms. Slight amount of smoke in escape alley of 310-2 and somewhat more in escape alley of 310-3. Considerable smoke in pipe gallery (mostly in 310-3). He smoke on operating floor.



# COMPREENTIAL

8. Location sens as (7). Vontilation sens as (7) except transcus in vicinity of test open.

Great amount of smoke pulled into basement, but all picked up by cell fans immediately below. Slight amount of smoke in escape alloy of 510-2 and considerable in escape alloy of 510-3. Fairly heavy in pipe gallery. He show on operating floor.

9. Stoke released behind D furnace in building K-101. Furnace room ventilator on. Furnace room doors closed.

Space behind furnaces eleared rather rapidly, but erea on north side of furnaces cleared very slowly (7-8 minutes). Door on north side opened momentarily and smoke drifted out door. Slight encunt drifted from ventilator exhaust through open windows on east side of still room.

10. Snoke released on main floor of still room between E-102 and F-109-B, building K-101. Still room doors closed. Dumping drum pit ventilator on. Tower ventilator on.

Vory little make came out pit ventilator. Practically no suck drifted any appreciable distance toward south and of lower floor. Considerable smoke on nezzemine floor. Duilding closeed in 7-8 minutes.

11. Snoke released in J-609 pump ream of building K-601. Pump ream, ascumulator ream and C-603 condensor ream doors closed. Condensor ream exhaust fam on. Supply fam in east wall of second floor carbon trap ream on.

Snoke exhausted from pump room through accumulator room to condensor room and thence to atmosphere quito rapidly. Some snoke picked up by supply fan mentioned above and drawn back into building. No snoke evidenced enywhere in building except as given above.

12. Snoke released in C-603 condenser room of building K-601. Condenser room door closed and exhaust fan on. Supply fan in east wall of second floor carbon trap room on.

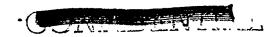
No smoke came out under condensor room door. No smoke down through condensor room floor grille. Some picked up by supply fan as in previous test.

· 13. Smoke released in second floor carbon trap room of building K-601 near stairway to condenser room. Both supply fems on. Doors and windows closed. Windows in third floor carbon trap room open. Roof ventilator on.

Carbon trap rooms cleared rather slowly (7.10 minutes). No smoke in other parts of building.

14. Smoke released in cell room of building K-601, adjacent to west wall just south of door. Cell room doors closed and exhaust fans on. Pipe gallery exhaust fans off.





Bulk of smoke picked up by adjacent enhaust for, but some drifted throughout room. No smoke come up stairway to pipe gallery.

15. Anoko roloased in armonia compressor area of building K-1101. Roof vontilators closed (not operable). Educat fans off.

Shoke drifted over entire section of building. After two or three minutes exhaust feas turned on and building eleared rapidly.

## OI Linua

- 33. Shoke released in withdrawal alley 1-A, adjacent to platform of building K-310-3, at a point near fact of stairway to operating floor.
  - (a) Adjacont tronsoms closed.
  - (b) Operating floor fans off.
  - (c) Doors at top of inside staircases open.
  - (d) imm woll doors open.
  - (o) All louvers in ducts over escape alloy open.
  - (f) All floor louvors open.
  - (g) All roof ventiletors open.

No snoke was visible on operating flow of S10-5. However, a slight odor of it was noticeable. A slight haze appeared on operating floor of 310-2. Nothing one up thru pump wells.

17. As above except doors at top of staircases plosed.

Again slight hazo was noted in SID-2 operating floor. This was found to be due to material being picted up by operating floor fans in SIO-2 basement. (Louvers it escape alley duets on operating floor of SIO-2 closed).

18. As above except operating floor fons off in both coms and 310-2.

Possible trace of smoke above open floor louvers - 510-2.

Note - Altho material was released near 310-3 side or alley the emisting air currents seemed to carry nest toward the east end and north side of alloy.

19. Release as above - ventilation as above except all fons in 310-7 and 3 off.

Snoke gradually drifted up through east end of pipe gellery in 310-2, and to an appreciable degree through operating floor louvers in that location.

# Hay 16.

20. Shoko released in 310-3 celd trap room between the two celd traps, toward east side of room. Doors, wall louvers and damper in exhaust duct closed, but fan was on. Bascacent fans operating.

Snoke drifted throughout room, but none escaped through louvers or around doors.





21. Some location - no additional release. Tall houvers and damper in enhant duet opened. Doors remained closed.

At the end of 30 minutes the room was still smely. It was estimated that another 15 minutes would be required to clear it. He smeke was evident outside room.

22. Snoke released as in (20), with ventilating conditions as in (20). As soon as all smoke was discharged, wall louvers, doors and damper in orderst duct were opened.

Shoko started to drift out through doorways. All doors woro then closed except one, which was left just crac.ed. He shoke escaped through this opening, but sufficient air currents were set up, due to pressure differential, to aid naterially in clearing room atmosphere. Room cleared more rapidly than in test 21.

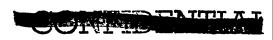
25. Snoke released in withdrawal alley No. 1, adjacent to open transon bosido cold trup room 310-3. All basement fans on. Wall louvers and exhaust fan duet in cold trap room open. Cold trap room doors closed.

Smoke was rapidly drawn into cold trap room through wall louvers.

Note - At conclusion of this test it was noted that the cutside of the filter in the deer to the carbon trap room was heavily caked with orange articles, indicating that a snoke of smaller particle size would undoubtedly be pulled into carbon trap room.

#### CONCLUCIONS

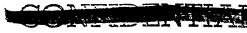
- (Tost 1) In the event of a release in the service alley, rooms on the outside (toward inside of U), would be affected, as well as pipe gallory immediately everhead, and building in general, including operating floor. The emergency ventilating conditions established for a release in the withdrawal alley should also be applied in case of a release in the service alley.
- 2. (Test 2 and 3) In the event of a fire of oil or waste in the basement adjacent to the operating floor fans, the make from such fire would be picked up by the operating floor fans and reach the operating floor so quickly (4 seconds) that the immediate shut down of operating floor funs would not 'men the operating floor free from spake.
- 3. (Tests 4 and 5) The closing of the transons along the withdrawal alloy is ineffective in climinating contamination of basement atmosphere, but does sorve to cut down the magnitude to such an extent that but little contaminant is picked up by operating floor fans.
- 4. (Test 1) The roof ventilators on the operating floor are not very effective in clearing the operating floor amosphere rapidly.







- 5. (Fost 5) Based on the experience of persons conducting the tests, the closing of all floor lowers on operating floor requires sufficient time to partially defeat its purpose. However, the necessity for closing these lowers is questionable, since in three tests (6,7,8) no another cane through open floor lowers, and in another test (18) there was only a trace from this source.
- 6. (Test 5,6,16,17 and 18) The position of the louvers in the duets over the oscape alloy has little, if any, effect on contamination of operating floor aknosphere.
- 7. (Test 4,16,17,18) Only in one test (4) was there any indication of material drifting up from pipe gallery through coolant pump wells, and this was not definite. The remaining tests of these given above indicated that there is no need for closing pump well doors in the event of a release of natorial on the lower floor.
- 8. (Test 5,6,16) In the event of a release on the cell floor, need for closing the doors at the top of staircases in withdrawal alley from cell to
  operating floor appears questionable, except when there is auxiliary
  ventilating equipment in operation near head of stairways.
- 9. (Test 1,4,5,6,7,8,16,17,18) In the event of a release on cell floor the fans supplying air to the operating floor of the building concerned, should be shut off immediately. It is also desirable to shut down the fans supplying air to the operating floor of the building immediately adjacent unless the two fan alloys are separated by a transformer wault (Tests 17 and 18).
- O. (Tost 19) In the event of a release of material on the coll floor the coll fans should be left on as they aid in clearing the atmosphere through ventilators over escape alloy and withdrawal alley.
- 1. (Tost 25) A release of natorial near the end of the withdrawal alley toward the inside of the U, and adjacent to a cold trap room will contaminate the cold trap room atmosphere, if cold trap room ventilating system is in normal operation.
- 12. (Tost 20) With damper in exhaust duct, wall louvers, and doors closed in the cold trap room, and with basement fans in operation, material released within cold trap room will not escape to the basement.
- 15. (Test 21 and 22) With cold trap room doors closed and ventilating equipment in normal operating condition, the removal of contaminant by existing ventilating equipment is very slow (>30 min.). The removal may be helped by eracking one door just enough to set up a current of air. Too much opening allows the contaminant to drift out to the basement area, due to the loss of pressure differential.
- 14. (Tests 20,21,22,23) In the event of an extensive release of material in cold trap room, the carbon trap room will probably be conteminated, due apparently to a pressure differential between the carbon trap room and the main cold trap room.
- 15. (Fost 9) The exhaust fam in the furnace room of building K-101 is not very efficient for electing the furnace room atmosphere, particularly the north portion of the room.





- 16. (Fost 9) Haterial enhausted from the present furnece room ventilator in hydleling K-101 will, under proper atmospheric conditions, be carried back into still room through windows on east side unless latter are kept closed and tightly scaled.
- 17. (Tost 10) An approciable release of material on the main floor of building E-101 will, even with tower wentilator on, be distributed ever messaning floor to a considerable extent. However, the building as a whole will be elemed fairly rapidly by existing ventilating equipment.
- 18. (Test 11). The exhaust fam in G-603 condensor room in building K-601 is quite afficient for electing the series of rooms for thich it was intended, i.e., J-609 pump room, talls accumulator room, and G-605 condensor room.
- 19. (Tost 12) With ordust ventilation on in C-603 condenser room of building K-601 notorial released therein is exhausted through ventilating fan and does not settle through floor grille. (However, with a settling period with fan off, as described in Safety Bulletin No. 7, it is apparent that some material will settle through floor grille into tails accumulator room.)
- 20. (Test 11 and 12) Haterial exhausted from ventilator for in dest well of C-603 condenser room of building K-601 will, under cortain atmospheric conditions, be carried back through the supply for in the east well of the carbon trap room.
- 21. (Fost 13) With all vontilating equipment in operation, material is cleared from carbon trap rooms (2nd and 3rd floor) of building K-601, rather slowly.
- 22. (Test 14) In the event of a release of material on west side of cell room of building K-601, its spread to other parts of the building can probably be controlled by the use of existing ventilating equipment.
- 23. (Tost 15) The present exhaust system in building K-1101 appears to be sufficient for an effective clearing of building atmosphere. However, the use of the roof ventilators would undoubtedly help.

# MIC LEHETDATIONS

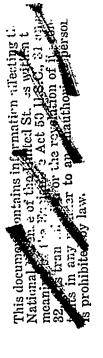
# It is recommended that:

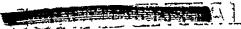
ONL TORM !!

- 1. Imorgoncy push button shut off switches for each building, controlling the operating floor ventilating fans, be located at strategic points in each building. (See supplemental shoot for details).
- 2. The transcus in the following locations be sealed closed from the end of the withdrawal alloy to a point just beyond the nearest cell room fon:
  - (a) Alloys on east side of U.
    Wost and and north side of alloy.
  - (b) Alleys on north end of U. South and end west side of alley.
  - (c) Alloys on west side of U.

    East end and south side of alley.

(This applies only to locations where adjacent cold trup rooms are to be used).





- 3. In the event of a release of material in a cold trap room, one door be left just cracked during the period that the atmosphere is being cleared by ventilating equipment. (Care must be taken that door is not opened sufficiently to cause flow of material from cold trap room to basement atmosphere).
- \*4. An additional exhaust fan be placed in the roof of the furnce room in building K-101, and such fan be equipped with a stack extending above tower doorway.
- \*5. The windows on the east side of the still room of building K-101 be sealed closed.
- \*6. The present roof ventilator in the furnace room of building K-101 be equipped with a stack extending above tower doorway.
- -7. The grille in the floor of C-603 condenser room in building K-601 be removed, the opening closed, and an exhaust fan, equipped with a stack extending above the roof of the building, be installed in the east wall of the tails accumulator room.
- -8. The present exhaust fan in the east wall of C-603 condenser room in building K-601 be equipped with a stack extending above roof level.
- 49. The roof ventilators in building K-1101 be made operative.

\* To be considered if K-101 is operated.

- Recommended by letter of April 5, 1945 from L. G. Bamer to H.D. Kinsey.

A Recommended Jan. 29, 1945 (recommendation from O.H. Helms to M.W. Carnes).

Technical Section Safety Department.

RFP:g





July 11, 1945

Subject: Operating Floor Fans.

The fans supplying air to the operating floor are located in the basement floor of the building and are fed by two (2) circuit breakers on the constant frequency bus.

The method of connection in a typical building is as follows:

The center row of fans #01-02-03-04 and 05 are used for ventilating the operating floor. These fans are electrically connected with adjacent fans supplying air to the cell floor; constant frequency breaker #7A feeds 9 fans and #4A feeds 6 fans. These breakers are remotely controlled from the operating floor and the operation of either breaker would start or stop the respective fan groups. Individual protection for the motors is provided by Trumbull AT35050G, 50 amp. 3 pole, 600 volt circuit breakers; these breakers allow for individual control of the fans manually but cannot be operated remotely.

To control the starting and stopping of the operating floor fans from remote locations on the operating, cell and basement floors it will be necessary to make changes to the existing facilities in one of the following methods:

- Utilize the spare breaker in the vault for the supply to the operating floor fans - this will require a feeder to be run. to the pull boxes at each of the columns at which these fans are located, a pair of wires can then be dropped from the control station for the breaker on the operating floor to the cell floor and basement to provide a trip circuit to take the breaker out of service by operation of a stop button at these locations
- Replace the present type Trumbull AT35050G breakers with magnetic starters at each of the operating floor fans; this will require no change in supply feeders. The remote control stations for stopping or starting fans will require a control circuit be run from each of these fan starters to the operating. cell and basement floors. Existing conduit can be used, but will have to be supplemented as field conditions require to obtain connections between fans and floors.

Submitted by:

Technical Section

Safety Department

Reviewed by:

Section Chief

AFB:

